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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/631,609	08/04/2000	Takeo Tanaami	000807	2753

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EXAMINER
FORMAN, BETTY J

ART UNIT	PAPER NUMBER
1634	

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13

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/631,609	TANAAMI, TAKEO	
	Examiner	Art Unit	
	BJ Forman	1634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 September 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *42-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *42-47* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. This action is in response to papers filed 9 September 2002 in Paper No. 12 in which claims 1-10 and 36-41 were canceled and claims 42-47 were added. All of the amendments have been thoroughly reviewed and entered. The previous rejections in the Office Action of Paper No. 11 dated 26 July 2002 under 35 U.S.C. 112, first and second paragraph and under 35 U.S.C. 103 are withdrawn in view of the amendments. The previous rejections under the judicially created doctrine of obviousness-type double patenting are maintained. All of the arguments have been thoroughly reviewed but are deemed moot in view of the amendments, withdrawn rejections and new grounds for rejection. New grounds for rejection are discussed.

Claims 42-47 are under prosecution.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 42-47 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. Claims 42, 43 and 46 are indefinite in Claim 42 for the recitation "providing polymerase chain reaction to amplify said biomolecules within said plurality of capillaries" because it is unclear whether "within said plurality of capillaries" modifies the "providing" or "amplifying" clause. It is suggested that Claim 42 be amended to clarify.

b. Claims 42, 43 and 46 are indefinite in Claim 42 for the recitation "to deposit said biomolecules on sites on said substrate at space intervals coinciding with said predetermined spacing" because "coinciding" is a non-specific relational term. Therefore the relationship between the sites on the substrate and the predetermined spacing is undefined. It is suggested that Claim 42 be amended to define the relationship.

c. Claims 44, 45 and 47 are indefinite in Claim 44 for the recitation "said plurality of capillaries are kept apart at all time so that no current flows" because it is unclear whether the capillaries are kept apart from each other or the substrate. It is suggested that Claim 44 be amended to clarify.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 42, 43 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Balch U.S. Patent No. 6,083,763, issued 4 July 2000) in view of Haff et al. (U.S. Patent No. 5,720,923, issued 24 February 1998) and Ohkawa (U.S. Patent No. 5,486,337, issued 23 January 1996).

Regarding Claims 42, 43 and 46, Balch teaches a method for producing biochip comprising the steps of: arranging a plurality of capillaries having bottom open ends disposed

at predetermined spacing so that said open ends are adjacent to and above a planar substrate, said open ends having a diameter which prevents biomolecules from dropping down by force of gravity (i.e. the capillaries must be primed to begin printing and therefore, biomolecules are prevented from dropping by force of gravity prior to priming, Column 15, lines 42-44), providing said biomolecules in said plurality of capillaries; applying voltage across said capillaries and substrate during the depositing to allow said biomolecules to move downward by force of attraction through said open ends to deposit said biomolecules onto said substrate at spaced intervals coinciding with said capillary spacing and stopping said voltage during non-depositing condition (i.e. the capillaries and reaction chambers are appropriately modified to maintain and modulate electro osmotic or electrophoretic potential, Column 15, lines 44-52) whereby accurate efficient control of said voltage applying causes uniform and reliable deposits of said biomolecules (Column 12, lines 13-29 and Claim 1) wherein said biomolecules are contained with said capillary and are DNA which is amplified i.e. PCR product is deposited onto the substrate (Column 35, lines 12-19 and Fig. 14) and wherein the biomolecules are deposited by applying a voltage across said capillary array i.e. electro-osmotic and/or electrophoretic force (Column 15, lines 48-50) and wherein the biomolecules are separated from said open ends of said capillaries as extremely marginal droplets and deposited onto said substrate (Column 15, lines 1-3) but they do not teach DNA contained within said capillary array is amplified within said capillaries by polymerase chain reaction. Haff et al. teach a similar method for producing an array of biomolecules wherein the biomolecules are deposited using a capillary array comprising a plurality of capillaries arranged in the same spacing interval as that of sites on the array and wherein the DNA within the capillary array is amplified within said capillaries by polymerase chain reaction (Column 4, lines 19-35 and Fig. 20) wherein the capillaries pass though "heat exchangers" to provide the required atmospheric temperature changes for the polymerase chain reaction (Column 18, lines 34-44 and Fig. 20 #212 and #213). It would have been obvious to one of ordinary skill in the art at the time the claimed

invention was made to modify the PCR amplification of the DNA in the method of Balch by amplifying the DNA within their capillaries (Claims 31) by changing atmospheric temperature surrounding each capillary (Claim 32) to thereby very rapidly change the temperature of the capillary and PCR reaction within the capillary to greatly reduce the time required for the PCR reaction as taught by Haff et al. (Column 5, lines 27-33) for the obvious benefits of economy time and labor.

Balch teaches the method wherein voltage is applied to deposit drops of picoliter size (Column 14, line 66-Column 15, line 1) from the open ends of the capillary onto the substrate i.e. electro-osmotic or electrophoretic force (Column 15, lines 44-60 and Claims 15, 18 and 19) but Balch and Haff et al do not specifically teach the capillaries are kept apart from the substrate at all times. However, applying voltage across a substrate and capillaries which are kept apart at all times so that they are oppositely charged thereby depositing onto a substrate a droplet of very small volume by force of attraction was well known in the art at the time the claimed invention was made as taught by Ohkawa (Abstract). Specifically, Ohkawa teaches that surface tension holding a droplet in a capillary (Column 3, lines 55-60) is overcome by applying voltage across the substrate and capillary so that the substrate and capillary are oppositely charged thereby allowing a very small volume droplet to move downward by force of attraction and to deposit onto the substrate (Column 7, lines 8-52) wherein the generation of these electrostatic forces deposit droplet without little if any loss of volume (Column 1, line 63-Column 2, line 1). It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to apply the electrostatic deposit of Ohkawa to the electrophoretic/electroosmotic deposit of Balch and to generate an electrostatic force between the capillaries and substrate while keeping them apart to thereby deposit very small volumes of biomolecules without loss of volume as taught by Ohkawa for the obvious benefit of maintaining biomolecule droplet volume (Column 1, line 63-Column 2, line 1).

6. Claims 44, 45 and 47are rejected under 35 U.S.C. 103(a) as being unpatentable over Balch U.S. Patent No. 6,083,763, issued 4 July 2000) in view of Haff et al. (U.S. Patent No. 5,720,923, issued 24 February 1998).

Regarding Claims 44, 45 and 47, Balch teaches the apparatus for producing biochips comprising: plurality of capillaries having bottom open ends arranged at a same spacing interval as that of sites on a planar substrate (i.e. capillary sleeve/array template, Column 12, lines 63-67) wherein said open ends have a diameter which prevents biomolecules from dropping down by force of gravity (i.e. the capillaries must be primed to begin printing and therefore, biomolecules are prevented from dropping by force of gravity prior to priming, Column 15, lines 42-44); adjusting means for adjusting a gap formed between said capillary holder means and said substrate i.e. print head and positioning device (Column 15, lines 26-37 and Claim 7); transfer means for transferring biomolecules from said capillaries to said substrate and enabling said biomolecules to remain in said plurality of capillaries during non-depositing state (i.e. the capillaries and reaction chambers are appropriates modified to maintain and modulate electro osmotic or electrophoretic potential, Column 15, lines 44-52) whereby accurate efficient control of said voltage applying causes uniform and reliable deposits of said biomolecules (Column 12, lines 13-29 and Claim 1) and voltage means for applying voltage across said capillary holder means e.g. electro-osmotic or electrophoretic force (Column 15, lines 44-52 and Claims 15, 18 and 19); whereby accurate efficient control of said voltage applying causes uniform and reliable deposits of said biomolecules (Column 12, lines 13-29 and Claim 1) wherein the biomolecules are separated from said open ends of said capillaries as extremely marginal droplets and deposited onto said substrate (Column 15, lines 1-3) and wherein said plurality of capillaries are kept apart at all times i.e. the capillaries are positioned

in array templates or sleeves that maintain the spatial arrangement and limit lateral movement of the individual capillaries (Column 15, lines 22-26). Additionally, Balch teach a PCR product is deposited onto the substrate (Column 35, lines 12-19 and Fig. 14) but they do not teach their apparatus comprises means for amplifying DNA in said capillaries by polymerase chain reaction. Haff et al. teach a similar apparatus for producing an array of biomolecules comprising a holder means for supporting a plurality of capillaries arranged in the same spacing interval as that of sites on the array (i.e. clamp bar, Fig. 20 # 234); means for adjusting a gap formed between said capillary holder and substrate (i.e. tube lift assembly, Fig 20, # 236); and means for transferring biomolecules from said capillaries to said substrate (i.e. plungers, Fig. 20 #266) and further comprising means for amplifying DNA in said capillaries by PCR (Column 4, lines 19-35 and Fig. 20) wherein the capillary PCR simplifies the PCR reaction by reducing thermal gradient problems and shortens the PCR reaction time by providing for very rapid temperature changes (Column 5, lines 11-16 and 28-33). It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the apparatus comprising capillary sleeve/array template through which the capillaries are spatially arrayed and controlled in the method of Balch (Column 12, lines 63-67) by incorporating a heat exchanging capillary sleeve/array template as taught by Haff et al. which also arrays and controls the capillaries but additionally provides the environment for amplifying DNA in the capillary by PCR to thereby provide and deposit PCR products rapidly and accurately as taught by Haff et al. (Column 5, lines 7-35) for the expected benefit of making continuous the amplification and deposition of the biomolecules into a single unified apparatus. The courts have stated that continuous operation of multiple process steps is obvious in view of the prior art teaching of the batch process (see *In re Dilnot*, 319 F.2d 188, 138 USPQ 248 (CCPA 1963 and MPEP, 2144.04 E.).

The claims recite numerous functional phrases and terms e.g. "said plurality of capillaries are kept apart at all times so that no current flows", "are deposited in a very small

volume", "swelled out through said open ends at bottom of said capillaries" and "where attractive forces between the solution and the substrate occur before contact". However, the courts have stated that claims drawn to an apparatus must be distinguished from the prior art in terms of structure rather than function see *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA1959). "[A]pparatus claims cover what a device is, not what a device does." Hewlett-Packard Co. v. Bausch & Lomb Inc., 909 F.2d 1464, 1469, 15 USPQ2d 1525,1528 (Fed. Cir. 1990) (see MPEP, 2114).

The claims are drawn to an apparatus for producing biochips comprising the following structural components i.e. a plurality of capillaries having bottom open ends arranged at a same spacing interval as that of sites on a planar substrate dispose below said open ends of said capillaries, said open ends having a diameter which provide a surface tension greater than gravitational force; amplifying means for temperature processing; adjusting means for adjusting a gap formed between said open ends of said capillaries and said substrate; transfer means for transferring said biomolecules from said plurality of capillaries to said sites on said substrate, said transfer means comprising voltage means for applying voltage across said capillaries and said planar substrate; and stopping means.

As detailed above, Balch and Haff et al teach the claimed structural components of the apparatus. Because the courts have stated that an apparatus must be distinguished from the prior art in terms of structure and because Balch and Haff et al teach the claimed structures, the claimed apparatus is obvious in view of the teaching of Balch and Haff et al.

Response to Arguments

7. Applicant argues that Balch uses electro-osmotic and/or electrophoretic force to apply and electric current thorough a solution after the solution has come into contact with the substrate and polymers are made to move by effects of the electric current which travels from the solution to the wetting solution. In contrast, Applicant states, the instant invention is drawn to capillaries and substrate which are kept apart from each other at all times and the

voltage is applied across the capillaries and substrate to produce an electric field between them.

Regarding the method claims, Applicant's argument is deemed moot in view of the amendments, withdrawn rejection and new grounds for rejection.

Regarding the apparatus claims, the argument is not found persuasive because the claim recitation "said plurality of capillaries are kept apart at all times" is interpreted as either functional or structural language neither of which distinguish the apparatus structurally over the apparatus of Balch and Haff et al. The structural interpretation describes the capillaries of Balch which are positioned in array templates or sleeves that maintain the spatial arrangement and limit lateral movement of the individual capillaries (Column 15, lines 22-26). The functional interpretation i.e. keeping the capillaries apart, does not limit or describe the structural components of the apparatus as required. Therefore, neither the structural or functional interpretation of the above recitation defines the apparatus over that of Balch and Haff et al.

Applicant argues that the instant invention does not require the substrate to be wetted with the solution as does the method of Balch. The argument has been considered but is not found persuasive because the open claim language "comprising" encompasses the additional elements in the method and apparatus of Balch.

Applicant argues that the instant invention permits deposit of extremely small amounts at the moment the solution comes into contact with the substrate. The argument has been considered but is not found persuasive because Balch teaches deposit of extremely small amounts (Column 14, line 66-Column 15, line 1). Therefore, the argument does not define the claimed invention over that of Balch.

Applicant argues that the instant invention is based on a technical principle with is totally different from that of Balch wherein the electrophoretic force does not arise until the solution comes into contact with the substrate. Regarding the method claims, the argument is

deemed moot in view of the amendments, withdrawn rejection and new grounds for rejection. Regarding the apparatus claims, Balch teach the structural components of the claims. Additionally, Balch is silent regarding the timing of the electrophoretic force relative to the time of solution contacting the substrate. Therefore, Applicant's assertion that Balch does not use electrophoretic force until the solution contacts the substrate is not relative to the teaching of Balch.

For the examiner's benefit, Applicant notes that "amplification is not a requirement of the invention wherein depositing of the solution onto the substrate is featured". Applicant's note is acknowledged. However, Claim 42 drawn to a method of producing biochip requires "providing polymerase chain reaction to amplify said biomolecules.....deposit said biomolecules". Hence, amplification is a requirement of the invention wherein depositing the solution onto the substrate is featured.

Applicant further argues that the using the instant invention "PCR can be speeded up by using thinner capillaries", it is possible to reduce the operating time and prevent contamination with dust by using both PCR and thin capillaries for spotting DNA solution at the same time". In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., faster PCR, thinner capillaries and prevention of contamination) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Double Patenting

8. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29

USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. Claims 42, 43 and 46 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 21-22 of copending Application No. 09/792,967. Although the conflicting claims are not identical, they are not patentably distinct from each other because both sets of claims are drawn to a method of producing biochip wherein biological polymers are deposited onto a substrate using a capillary array comprising a plurality of capillaries having the same spacing interval as that of sites on the substrate, wherein the biological polymers are DNA which are amplified within the capillaries using the polymerase chain reaction (PCR) wherein the PCR is performed at atmospheric temperature or by heating by laser irradiation and wherein the samples are deposited by applying voltage across the capillary array and substrate. The sets of claims differ only in the arrangement or grouping of the limitations and terminology e.g. the '967 set recites "wherein said DNA is amplified within said capillaries by polymerase chain reaction" and the instant set recites "providing polymerase chain reaction to amplify said biomolecules within said plurality of capillaries". Because both sets of claims are essentially the same being drawn to the same invention and differ only in the arrangement of the limitation, the instant claims are obvious over the '967 claims.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Response to Applicant's Comments

9. Regarding the above rejection under the judicially created doctrine of obviousness-type double patenting Applicant states that because the instant application is senior to the '967 application, the instant application should be the first to issue and a terminal disclaimer will

be filed in the '967 application if necessary. Applicant's statements are acknowledged. The rejection is maintained.

Conclusion

10. No claim is allowed.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to BJ Forman whose telephone number is (703) 306-5878. The examiner can normally be reached on 6:30 TO 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Jones can be reached on (703) 308-1152. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-4242 for regular communications and (703) 308-8724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0196.

BJ Forman, Ph.D.
Patent Examiner
Art Unit: 1634
November 27, 2002